

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1-39. (Canceled).

40. (Currently Amended): An illumination system for a microlithography projection exposure machine for illuminating an illumination field with light from a primary light source, comprising:

a pupil shaping unit configured to produce a prescribed light distribution in a pupil plane of the illumination system;

a transmission filter apparatus configured for spatially dependent intensity filtering of an incident light distribution, the transmission filter apparatus being arranged at or in a vicinity of ~~a~~the pupil plane of the illumination system or at or in a vicinity of a further pupil plane conjugate to the pupil plane;

wherein the transmission filter apparatus includes at least one retardation device configured to be operated in transmission to produce a spatially dependent retarding effect on the light of the incident light distribution, where the retardation device is configured to be driven to produce a temporally variable, spatially dependent retarding effect; and

at least one polarization filter arrangement arranged in a light path downstream of the retardation device.

41. (Previously Presented): The illumination system according to claim 40, wherein the transmission filter apparatus is arranged in a plane having a numerical aperture < 0.1 .

42. (Currently Amended): The illumination system according to claim 40, wherein the illumination system includes a field intermediate plane optically downstream of the pupil shaping unit and an imaging objective configured to image the intermediate field plane onto the illumination field of the illumination system,

wherein the transmission filter apparatus is arranged ~~in~~at or in a vicinity of ~~a~~the further pupil plane of the imaging system.

43. (Previously Presented): The illumination system according to claim 40, configured without a light mixing unit for homogenizing the illuminating light.

44. (Previously Presented): The illumination system according to claim 40, further comprising a regulating unit connected to a control device connected to the transmission filter arrangement and to the pupil shaping unit, the regulating unit being configured to tune the spatially dependent intensity filtering provided by the transmission filter arrangement to the light distribution provided in the pupil plane at or in the vicinity of the transmission filter apparatus.

45. (Previously Presented): The illumination system according to claim 44, wherein the control device is configured to control the transmission filter apparatus such that a transmission filter effect of the transmission filter apparatus is adapted to a minimum intensity value of the incident light distribution such that the transmission filter apparatus is effective to homogenize the incident light distribution by reducing local transmission in areas outside a region of minimum intensity in the incident light distribution.

46. (Previously Presented): The illumination system according to claim 40, wherein the retardation device is configured to be continuously driven to produce a temporally variable, spatially dependent retarding effect.

47. (Previously Presented): The illumination system according to claim 40, wherein the retardation device comprises a cell arrangement having a plurality of cells configured to be driven individually and independently of one another.

48. (Previously Presented): The illumination system according to claim 47, wherein the cell arrangement comprises at least one nonlinear optical crystal producing a linear electro-optical effect in the light passage direction of the incident light distribution.

49. (Previously Presented): The illumination system according to claim 48, wherein the nonlinear optical crystal is transparent to light in a wavelength region below 200 nm.

50. (Previously Presented): The illumination system according to claim 48, wherein the nonlinear optical crystal consists essentially of one of beta barium borate (BBO), potassium hydrogen phosphate (KDP), deuterated potassium hydrogen phosphate (DKDP) and lithium triborate (LBO).

51. (Previously Presented): The illumination system according to claim 48, wherein the nonlinear optical crystal is designed as a plane plate that completely covers the region of incident light distribution and has a first and second plate face.

52. (Previously Presented): The illumination system according to claim 51, wherein a plurality of first electrodes electrically separated from one another are mounted on the first plate face and a plurality of second electrodes electrically separated from one another are mounted on the second plate face, and first and second electrodes are assigned to one another in pairs to form a plurality of electrode pairs electrically separated from one another, each electrode pair defining a cell of the cell arrangement.

53. (Previously Presented): The illumination system according to claim 51, wherein a plurality of first electrodes electrically separated from one another are mounted on the first plate face, and at least one second electrode is mounted on the second plate face, a number of first electrodes being assigned a common second electrode.

54. (Previously Presented): The illumination system according to claim 51, wherein a plurality of first electrodes electrically separated from one another are mounted on the first plate face, and the second plate face has a single second electrode to which the plurality of first electrodes are assigned.

55. (Previously Presented): The illumination system according to claim 51, wherein electrodes electrically separated from one another are arranged on the crystal at a spacing from one another that is large compared with a plate thickness of the nonlinear optical crystal.

56. (Previously Presented): The illumination system according to claim 51, wherein electrodes mounted on at least one face of the plane plate are substantially free from material tips causing high field strengths.

57. (Previously Presented): The illumination system according to claim 51, wherein electrodes are mounted on at least one face of the plane plate and wherein at least one electrode is coated with an antireflection layer.

58. (Previously Presented): The illumination system according to claim 51, wherein electrodes are mounted on at least one face of the plane plate and wherein at least one electrode is designed as a grid electrode having a plurality of webs made from electrically conducting material, the webs being spaced apart from each other such that a high transparent area fraction is obtained.

59. (Previously Presented): The illumination system according to claim 51, wherein electrodes are mounted on at least one face of the plane plate and wherein the electrodes are designed to be partially transparent such that a transmission loss caused in the incident light distribution by the electrodes is less than 20% upon passage through the cell arrangement.

60. (Previously Presented): The illumination system according to claim 51, wherein electrodes are mounted on the first face and the second face of the plane plate, and a control device is assigned to the transmission filter apparatus and configured to produce electrical potential differences independently of one another between first electrodes electrically separated from one another on the first plate face and respective assigned electrodes of the second plate face.

61. (Previously Presented): The illumination system according to claim 40, wherein the retardation device comprises at least one retardation element made from a stress birefringent material, and further comprising a stressing device having at least one actuator acting on the retardation element to set a prescribed stressed state of the retardation element in accordance with a prescribed spatial distribution.

62. (Previously Presented): The illumination system according to claim 61, wherein the retardation device has only a single retardation element in the form of an essentially plane-parallel plate.

63. (Previously Presented): The illumination system according to claim 61, wherein the stressing device has at least one actuator pair with a pair of actuators that are arranged diametrically opposite one another with reference to a central axis of the retardation element.

64. (Previously Presented): The illumination system according to claim 61, wherein the stressing device comprises a number of actuator pairs configured to be driven independently of one another.

65. (Previously Presented): The illumination system according to claim 61, wherein the stressing device is designed to set the stress distributions that exhibit a multiple radial symmetry with reference to a central axis of the retardation element.

66. (Previously Presented): The illumination system according to claim 65, wherein the multiple radial symmetry is one of a 2-fold, 4-fold, 6-fold and 8-fold radial symmetry.

67. (Previously Presented): The illumination system according to claim 40, further comprising a movement device is assigned to the retardation device for moving the retardation device relative to other components of the transmission filter apparatus.

68. (Previously Presented): The illumination system according to claim 67, wherein the movement device is designed as a rotation device configured to rotate the retardation device about an axis of rotation coinciding with an optical axis of the illumination system.

69. (Previously Presented): The illumination system according to claim 40, further comprising a changing device is assigned to the transmission filter apparatus and configured to interchange a first retardation device with a first spatially dependent retarding effect against at least one second retardation device with a second spatially dependent retarding effect that differs from the first retarding effect.

70. (Previously Presented): The illumination system according to claim 40, further comprising a polarizer arrangement arranged in a light path upstream of the retardation device to provide at least a partially polarized incident light distribution striking the retardation device.

71. (Previously Presented): The illumination system according to claim 70, wherein the polarization filter arrangement comprises at least one thin film polarizer.

72. (Previously Presented): The illumination system according to claim 40, wherein the polarization filter arrangement comprises at least one transparent plane plate that is arranged substantially at the Brewster angle with respect to the incident light.

73. (Previously Presented): The illumination system according to claim 40, wherein the polarization filter arrangement comprises at least one polarization splitter block with a polarization splitter layer that is enclosed between transparent material and is arranged substantially at the Brewster angle with reference to the incident light.

74. (Previously Presented): An exposure method for exposing a substrate arranged in a region of an image plane of a projection objective with at least one image of a pattern, arranged in a region of an object plane of the projection objective, of a mask, comprising:

illuminating the pattern with the aid of illuminating radiation from an illumination system as claimed in claim 40 to produce radiation modified by the pattern; and

transirradiating the projection objective with the aid of the radiation modified by the pattern to produce an output radiation directed onto the substrate;

the intensity distribution of the illuminating radiation in the object plane of the projection objective being variably set as a function of space and time with the aid of the transmission filter apparatus.

75. (Previously Presented): The exposure method as claimed in claim 74, further comprising:

setting a first light distribution using the pupil shaping unit;

performing a first spatially dependent intensity filtering utilizing the transmission filter apparatus;
setting a second light distribution at the pupil shaping unit, the second light distribution differing from the first light distribution; and
filtering the second light distribution at the transmission filter apparatus.

76. (Previously Presented): The exposure method according to claim 74, wherein the intensity distribution of the illuminating radiation is set with the aid of the control device to the minimum intensity value of the incident light distribution in order to produce a homogenizing effect.